

CLAIMS

What is claimed is:

1. A method, comprising:
 - identifying an operation involving a plurality of input values;
 - invoking an object associated with the identified operation;
 - performing the operation via the invoked object; and
 - automatically generating, as a part of the operation via the object, accuracy information associated with the operation for each of the plurality of input values.
2. The method of claim 1, further comprising:
 - creating the object associated with the identified operation; and
 - initializing the object using the plurality of input values prior to performing the operation.
3. The method of claim 2, further comprising receiving the plurality of input values as parts of parameters associated with the object when the object is created.
4. The method of claim 1, wherein the object comprises one or more member functions to perform the operation and to substantially concurrently generate the accuracy information associated with the operation.
5. The method of claim 1, further comprising defining a computational model, as a member of the object, to generate the accuracy information for the operation.

6. The method of claim 5, wherein defining the computation model comprises:
 - identifying a theoretical result of the operation based on an input value;
 - defining an input independent error associated with the input value;
 - defining an input dependent error associated with the input value; and
 - obtaining an actual result of the operation based on the theoretical result, the input independent error, and input dependent error.
7. The method of claim 6, wherein the actual result of the operation is obtained via a summation of the theoretical result, the input independent error, and input dependent error.
8. The method of claim 6, wherein the computational model comprises one of a probability density function and one or more upper-bound functions representing the accuracy of the operation.
9. The method of claim 8, wherein the probability density function represents a probability density of the input independent errors.
10. The method of claim 8, wherein the one or more upper-bound functions comprise a first upper-bound function and a second upper-bound function, the first upper-bound function representing upper bound values associated with the input dependent errors and the second upper-bound function representing upper bound values associated with the actual results of the operation.

11. The method of claim 1, wherein the operation comprises one of an addition, a multiplication, and a shifting operation.
12. The method of claim 1, wherein the accuracy information includes differences between a theoretical result and an actual result of the operation.
13. The method of claim 1, wherein the plurality of input values comprises multi-dimensional vectors of values.
14. The method of claim 1, wherein the object is invoked via an inheritance of an object oriented programming (OOP) environment.
15. The method of claim 14, further comprising overloading an operator associated with the operation via the OOP environment, such that the accuracy information is obtained transparently with respect to the actual operation.
16. A machine-readable medium having executable code to cause a machine to perform a method, the method comprising:
 - identifying an operation involving a plurality of input values;
 - invoking an object associated with the identified operation;
 - performing the operation via the invoked object; and
 - automatically generating, as a part of the operation via the object, accuracy information associated with the operation for each of the plurality of input values.

17. The machine-readable medium of claim 16, wherein the method further comprises defining a computational model, as a member of the object, to generate the accuracy information for the operation.
18. The machine-readable medium of claim 17, wherein defining the computation model comprises:
 - identifying a theoretical result of the operation based on an input value;
 - defining an input independent error associated with the input value;
 - defining an input dependent error associated with the input value; and
 - obtaining an actual result of the operation based on the theoretical result, the input independent error, and input dependent error.
19. The machine-readable medium of claim 18, wherein the actual result of the operation is obtained via a summation of the theoretical result, the input independent error, and input dependent error.
20. The machine-readable medium of claim 18, wherein the computational model comprises one of a probability density function and one or more upper-bound functions representing the accuracy of the operation.
21. The machine-readable medium of claim 20, wherein the probability density function represents a probability density of the input independent errors.
22. The machine-readable medium of claim 20, wherein the one or more upper-bound functions comprise a first upper-bound function and a second upper-bound function, the first upper-bound function representing upper bound values associated with the input

dependent errors and the second upper-bound function representing upper bound values associated with the actual results of the operation.

23. The machine-readable medium of claim 16, wherein the operation comprises one of an addition, a multiplication, and a shifting operation.
24. The machine-readable medium of claim 16, wherein the object is invoked via an inheritance of an object oriented programming (OOP) environment.
25. The machine-readable medium of claim 24, wherein the method further comprises overloading an operator associated with the operation via the OOP environment, such that the accuracy information is obtained transparently with respect to the actual operation.
26. A data processing system, comprising:
 - a processor;
 - a memory coupled to the processor; and
 - a process executed by the processor from the memory to cause the processor to
 - identify an operation involving a plurality of input values,
 - invoke an object associated with the identified operation,
 - perform the operation via the invoked object, and
 - automatically generate, as a part of the operation via the object, accuracy information associated with the operation for each of the plurality of input values.

27. The data processing system of claim 26, wherein the process further causes the processor to define a computational model, as a member of the object, to generate the accuracy information for the operation.
28. The data processing system of claim 27, wherein defining the computation model comprises:
 - identifying a theoretical result of the operation based on an input value;
 - defining an input independent error associated with the input value;
 - defining an input dependent error associated with the input value; and
 - obtaining an actual result of the operation based on the theoretical result, the input independent error, and input dependent error.
29. The data processing system of claim 27, wherein the computational model comprises one of a probability density function and one or more upper-bound functions representing the accuracy of the operation.
30. The data processing system of claim 29, wherein the probability density function represents a probability density of the input independent errors, and wherein the one or more upper-bound functions comprise a first upper-bound function and a second upper-bound function, the first upper-bound function representing upper bound values associated with the input dependent errors and the second upper-bound function representing upper bound values associated with the actual results of the operation.